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ABSTRACT

Using a common methodology, two experiments examined the effects of learning and performance goals in conjunction with self-evaluation as fourth-graders acquired mathematical fraction skills. After a pretest on fractions, self-efficacy, skill persistence, and goal orientation, children in the first study--who were average achievers in mathematics--received instruction on addition and subtraction of fractions over seven sessions, and worked under conditions involving learning goals or performance goals. Six self-evaluations were conducted, and a posttest followed. In the second study, which was designed to explore conditions under which learning goals might be more effective than performance goals in raising achievement outcomes, self-evaluation and pre- and posttests were also included. The two studies showed that providing students with a goal of learning to solve problems enhances their self-efficacy, skill, motivation, and task orientation, and that these achievement outcomes also are promoted by allowing students to evaluate their performance capabilities or progress in skill acquisition. (DR)

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Self-Monitoring of Skill Acquisition Through Self-Evaluation of Capabilities

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Abstract

An important component of self-regulation is learners' self-monitoring of their achievement beliefs. One type of belief is perceived self-efficacy, or personal judgments of one's capabilities. Self-regulation requires holding an optimal sense of self-efficacy. Positive self-evaluations of learning sustain efficacy and motivation, and lead to effective self-regulatory activities and higher achievement. Data are presented showing that explicit self-monitoring of skill acquisition through self-evaluation of capabilities enhances students' achievement outcomes and that self-evaluation is most effective when it is explicitly linked with students' goals. These projects, which studied fourth-grade students as they acquired fraction skills, showed that providing students with a goal of learning to solve problems enhances their self-efficacy, skill, motivation, and task orientation, and that these achievement outcomes also are promoted by allowing students to evaluate their performance capabilities or progress in skill acquisition. Results are discussed in terms of the process whereby goals and self-evaluation affect achievement outcomes, and implications of the results for educational practice are summarized.

Self-Monitoring of Skill Acquisition

Through Self-Evaluation of Capabilities

A topic assuming increasing educational importance is learners' self-regulation of their cognitions, motivation, and behaviors, to promote academic achievement (Zimmerman, 1989, 1990, 1994). Self-regulation refers to the process whereby students activate and sustain cognitions, behaviors, and affects, which are oriented toward the attainment of goals. Self-regulation includes such activities as: attending to and concentrating on instruction; organizing, coding, and rehearsing information to be remembered; establishing a productive work environment; using resources effectively; holding positive beliefs about one's capabilities, the value of learning, the factors influencing learning, and the anticipated outcomes of actions; and experiencing pride and satisfaction with one's efforts (Schunk, 1989).

Effective self-regulation requires that students have goals and the motivation to attain them (Bandura, 1986; Zimmerman, 1989). Students must regulate not only their actions but also their underlying achievement-related cognitions, beliefs, intentions, and affects. An increasing body of research substantiates the idea that learners' self-monitoring of their achievement beliefs sustains learning efforts and promotes achievement (Schunk, 1989; Schunk & Zimmerman, 1994; Zimmerman & Martinez-Pons, 1992).

Theoretical Background

The conceptual focus of this paper is social cognitive theory, which views self-regulation as comprising three processes: self-observation, self-judgment, self-reaction (Bandura, 1986; Kanfer & Gaelick, 1986). Self-observation (or self-monitoring) is deliberate attention to aspects of one's behavior. Self-monitoring is necessary but by itself insufficient for sustained self-regulation. A second process is self-judgment, which refers to comparing present performance with one's goal. Such comparisons inform one of goal progress and can exert motivational effects on future performance. Self-reactions to goal progress may be evaluative or tangible. Evaluative reactions involve beliefs about progress. The belief that one is making progress, along with the anticipated satisfaction of goal accomplishment, enhances self-efficacy and sustains motivation. People also may react in a tangible fashion to perceived progress; for example, by buying something they want or taking a night off from studying. The anticipated consequences of behavior rather than the consequences themselves boost motivation (Bandura, 1986).

At the start of learning activities students have such goals as acquiring skills and knowledge, finishing work, and making good grades. During the activities students observe, judge, and react to their perceptions of goal progress. These self-regulatory processes interact with one another. As students observe aspects of their behavior they judge

them against standards and react positively or negatively. Their evaluations and reactions set the stage for additional observations of the same behaviors or of others. These processes also interact with the environment (Zimmerman, 1989). Students who judge their learning progress as inadequate may react by asking for teacher assistance. In turn, teachers may teach students a more efficient strategy, which students then use to foster learning.

Effective self-regulation depends on students developing a sense of self-efficacy for learning and performing well. Self-efficacy refers to personal beliefs about one's capabilities to learn or perform skills at designated levels (Bandura, 1986). Self-efficacy is hypothesized to influence choice of activities, effort expended, persistence, and achievement. Compared with students who doubt their learning capabilities, those with high self-efficacy for accomplishing a task participate more readily, work harder, persist longer when they encounter difficulties, and achieve at a higher level.

Learners acquire information to appraise their self-efficacy from their performance accomplishments, vicarious (observational) experiences, forms of persuasion, and physiological reactions (Schunk, 1989). Information acquired from these sources does not influence self-efficacy automatically but rather is cognitively appraised (Bandura, 1986). Learners weigh and combine the contributions of such factors as perceptions of their ability, task difficulty,

amount of effort expended, amount and type of assistance received from others, perceived similarity to models, and persuader credibility (Schunk, 1989).

Effective self-regulation depends on holding an optimal sense of self-efficacy for learning during task engagement (Bandura, 1986; Bouffard-Bouchard, Parent, & Larivee, 1991; Zimmerman, 1989). Students who feel efficacious about learning choose to engage in tasks, select effective strategies, expend effort, and persist when difficulties are encountered (Bandura, 1991; Schunk, 1991; Zimmerman, 1989). As students work on a task they compare their performances to their goals. Self-evaluations of progress enhance self-efficacy and keep students motivated to improve.

Self-Evaluation and Self-Regulation

Of critical importance for learner self-regulation during skill acquisition is the process of <u>self-evaluation</u> of capabilities and progress in skill acquisition. The self-evaluation process comprises both self-judgments of present performance by comparing it to one's goal and self-reactions to those judgments by deeming performance noteworthy, unacceptable, and so forth. Positive self-evaluations lead students to feel efficacious about learning and motivated to continue to work diligently because they believe they are capable of making further progress (Schunk, 1991). Low self-judgments of progress and negative self-reactions will not necessarily diminish self-efficacy and motivation if students believe they are capable of

succeeding but that their present approach is ineffective (Bandura, 1986). Such students may alter their self-regulatory processes by working harder, persisting longer, adopting what they believe is a better strategy, or seeking help from teachers and peers (Schunk, 1990). These and other self-regulatory activities are likely to lead to success (Zimmerman & Martinez-Pons, 1992).

There is little research that addresses the effects of students' self-evaluations of capabilities and progress in skill acquisition during cognitive skill learning, although other evidence provides indirect support for the preceding ideas. Research with children during learning of mathematical skills (Schunk & Hanson, 1985; Schunk, Hanson, & Cox, 1987) and writing skills (Schunk & Swartz, 1993a, 1993b) shows that measures of self-efficacy for learning or improving skills collected prior to receiving instruction predict subsequent motivation and skill acquisition. Masters and Santrock (1976) found that preschool children who verbalized self-judgmental statements during performance of an effortful handle-turning task (e.g., "I'm really good at this") persisted longer than children who verbalized self-critical or neutral statements.

Bandura and Cervone (1983) obtained benefits of goals and self-evaluative feedback. College students pursued a goal of increasing motor-skill performance by 40% over baseline, others were given feedback indicating they increased performance by 24%, and those in a third condition

received goals and feedback. Goals plus evaluative feedback had the strongest effect on performance and self-efficacy for goal attainment, which predicted subsequent effort. Bandura and Cervone (1986) gave subjects a goal of 50% improvement and false feedback indicating they achieved an increase of 24%, 36%, 46%, or 54%. Self-efficacy was lowest for the large substandard discrepancy (24%) and highest for the small suprastandard discrepancy (54%). Subjects then indicated goals for the next session and performed the task. Effort was positively related to self-set goals and self-efficacy across conditions. A measure of self-evaluation (self-satisfaction with performance) showed that the greater the dissatisfaction and the higher the self-efficacy the stronger was the subsequent effort expenditure.

Students may not spontaneously self-evaluate their capabilities. One means of highlighting progress is to have them periodically assess their progress in skill acquisition. Such explicit capability self-evaluations constitute a type of self-monitoring because students are asked to attend to their present performance and compare it with their prior performance to note progress. By making performance improvements salient, such self-monitoring is apt to raise self-efficacy, sustain self-regulatory activities, and promote skills.

In this paper I present some data showing that explicit self-monitoring of skill acquisition through self-evaluation of capabilities enhances students' achievement outcomes and

that self-evaluation is most effective when it is explicitly linked with students' goals. Specifically, the research I summarize examines the effects of self-evaluative processes among children during cognitive skill learning in conjunction with goals denoting learning or performance outcomes.

Goals provide standards against which people compare their present performances (Bandura, 1986; Locke & Latham, 1990). When students adopt a goal they may experience a sense of efficacy for attaining it, which motivates them to engage in appropriate activities, attend to instruction, persist, and expend effort. Students' initial self-efficacy is substantiated as they observe their goal progress because perceptions of progress convey they are becoming skillful. Self-efficacy sustains motivation and leads learners to establish new goals when they master their present ones (Bandura, 1988; Schunk, 1991). In general, goals that incorporate specific performance standards, are close at hand, and are moderately difficult, are more likely to enhance performance than goals that are general, extend into the distant future, or are perceived as overly easy or difficult (Locke & Latham, 1990; Schunk, 1990, 1991).

Goal effects also may depend on whether the goal denotes a learning or performance outcome (Meece, 1991). A learning goal refers to what knowledge and skills students are to acquire; a performance goal denotes what task students are to complete (Dweck & Leggett, 1988). Goal

setting research typically has focused on such goals as rate or quantity of performance, but educators increasingly are advocating greater emphasis on learning processes and strategies (Weinstein, Goetz, & Alexander, 1988).

Learning and performance goals may exert different effects on motivation and achievement outcomes even when their goal properties are similar (Schunk & Swartz, 1993a, 1993b). Learning goals focus students' attention on processes and strategies that help them acquire capabilities and improve their skills (Ames, 1992). Students who pursue a learning goal are apt to experience a sense of self-efficacy for attaining it and engage in task-appropriate activities (e.g., expend effort, persist, use effective strategies) (Bandura, 1986; Schunk, 1989). Learners' self-efficacy is substantiated as they work on the task and assess their progress. Perceived progress in skill acquisition and a sense of self-efficacy for continued learning sustain self-regulatory activities and enhance academic performance (Schunk, 1991).

In contrast, performance goals focus students' attention on completing tasks. Such goals may not highlight the importance of the processes and strategies underlying task completion or raise self-efficacy for acquiring skills (Schunk & Swartz, 1993a, 1993b). As students work on the tasks, they may not compare their present and past performances to determine progress. Performance goals can lead to socially comparing one's work with that of others,

which can result in low perceptions of ability among students who experience difficulties (Ames, 1992). Research generally has supported these ideas (Elliott & Dweck, 1988; Meece, Blumenfeld, & Hoyle, 1988; Schunk & Rice, 1991; Schunk & Swartz, 1993a, 1993b).

Research Evidence

The present two studies extended this literature by examining the effects of learning and performance goals in conjunction with self-evaluation as children acquired mathematical fraction skills (Schunk, in press). There is little research on the operation of these goals and self-evaluative processes during learning of cognitive skills. The studies utilized a common methodology. Fourth-grade students who were average achievers in mathematics were pretested on fractions self-efficacy, skill, persistence, and goal orientation. Following the pretest, children were assigned to experimental conditions and received instruction on addition and subtraction of fractions over seven sessions. Children worked under conditions involving learning or performance goals. In the learning goal condition, children were advised that their goal during the sessions was to learn how to solve fraction problems, whereas in the performance goal condition children were told that their goal was to solve fraction problems. Self-evaluation assessments were collected during the instructional program. A posttest was given at the end.

Goal orientations (sets of behavioral intentions that influence how students approach and engage in learning activities) were assessed to determine if the goal and self-evaluation conditions exert differential effects on students' propensities toward various classroom goals. The goal orientation inventory included items adapted from Meece et al. (1988). Each item tapped one of four goal orientations: task--desire to independently master and understand academic work; ego--desire to perform well to please the teacher and avoid trouble; affiliative--desire to share ideas and work with peers; work avoidant--desire to accomplish academic work with minimum effort. Children judged how well each item described how they usually felt during mathematics.

The self-efficacy test assessed children's perceived capabilities for correctly solving types of fraction problems. There were 31 pairs of problems. The two problems constituting each pair were similar in form and operations required and corresponded to one problem on the skill test although they involved different numbers. For each pair, children judged their certainty of solving problems of that type (e.g., same form, requiring the same operations, comparable in difficulty) by marking the efficacy value that corresponded to how they felt.

The skill test was administered after the efficacy assessment. It comprised 31 fraction problems in six different categories involving addition with like and unlike

denominators and carrying and no carrying, and subtraction with like and unlike denominators and no regrouping. For each problem children decided how long to work on it. The tester also recorded the length of time children spent solving problems as a measure of persistence.

In the first study, children were assigned randomly within gender, ethnic background, and classroom, to one of four experimental conditions: learning goal with self-evaluation, learning goal without self-evaluation, performance goal with self-evaluation, performance goal without self-evaluation. Students received 45-minute instructional sessions over seven days. On each day children covered one of the six major types of fraction skills (in a packet) described above and on the seventh day they reviewed material.

At the start of each session, the teacher gave the goal instructions appropriate for children's condition, after which she verbally explained and demonstrated the relevant fraction operations by referring to the explanatory page and by illustrating examples on the board. Included in this phase was instruction on applications of the fraction operations to real-world problems. After this modeled demonstration phase (about 10 min), students engaged in hands-on activity and solved practice problems (guided practice, about 10 min). Once the teacher was satisfied that children understood what to do, children solved

problems alone during independent practice for the remainder of the session (25 min).

Learning-goal students were told at the start of each session that their goal was to learn how to solve fraction problems; performance-goal students were advised that their goal was to solve problems. Within each goal condition, half of the students engaged in explicit self-evaluation. Children judged their fraction capabilities at the end of each of the first six sessions. They judged how certain they were they could solve the types of fraction problems covered during that session.

The results showed that students who received learning goals (with or without self-evaluation) and those given the performance goal with self-evaluation scored higher on self-efficacy, skill, and task orientation, and lower on ego orientation, than did students given the performance goal without self-evaluation. The number of problems children completed during the independent practice portions of the instructional sessions was analyzed to determine the effects of treatments on children's motivation. Students given the performance goal without self-evaluation solved significantly fewer problems than did students in the other three conditions. More rapid problem solving was not attained at the expense of accuracy; experimental conditions did not differ in the proportion of problems solved correctly.

Product-moment correlations revealed that the number of problems that children completed related positively to self-efficacy, skill, and persistence, and negatively to ego orientation. Self-efficacy, skill, and persistence, were positively related. Task orientation related positively to self-efficacy and skill; ego orientation correlated negatively with these measures.

The second study was designed to better explore the conditions under which learning goals might be more effective than performance goals in raising achievement outcomes. The self-evaluation treatment in Experiment 1 was powerful in that it required children to assess their fraction capabilities on six occasions. Given that the instructional program was designed to teach skills and that children's skills were improving, this type of repetitive self-evaluation treatment may have made it highly probable that children would perceive their skill improvement and likely outweighed any differential effects due to type of goal. Although Experiment 1 showed that learning goals are more effective than performance goals in the absence of explicit self-evaluation, perhaps learning goals also would prove advantageous when self-evaluation is less frequent or more subtle in nature. This type of situation reflects much school learning because learners typically do not assess their performance capabilities.

In the second study subjects were assigned to a learning goal or performance goal condition but all received

the opportunity for self-evaluation. The actual self-evaluation procedure was modified in that judgments were collected once (near the end of the instructional program) rather than six times (after each session). The procedure also was more subtle in that children assessed their progress in acquiring skills rather than their capabilities for solving types of problems as they had in the first study. Theory and research show that progress indicators of cognitive skill acquisition often are unclear and many children find it difficult to determine whether they are making progress (Schunk & Swartz, 1993a, 1993b).

The second study also included a measure of self-satisfaction that required children to judge how pleased they were with their progress in skill acquisition for solving problems. This measure was collected because self-satisfaction is included in the self-reaction phase of self-regulation and is an integral component of the self-evaluation process (Bandura, 1986; Schunk, 1991). I also collected a measure of self-efficacy for learning at the start of the first instructional session to determine whether the goal instructions differentially affected perceived capabilities for learning prior to receiving instruction and practice.

The results showed that the learning goal condition scored higher than the performance goal condition on self-efficacy, skill, task orientation, number of problems completed during the instructional sessions, self-

evaluation, and self-satisfaction. Performance-goal students scored higher than learning-goal subjects on ego and wórk avoidant orientation. The two conditions did not differ in self-efficacy for learning.

Product-moment correlations were comparable to those obtained in the first study. In addition, self-efficacy for learning related positively to number of problems completed, as did self-evaluation and self-satisfaction. Self-evaluation and self-satisfaction scores related positively to posttest self-efficacy, skill, and task orientation; self-evaluation was negatively related to ego orientation. Self-satisfaction was positively correlated with self-evaluation.

Discussion

The results of these two studies show that providing students with a goal of learning to solve problems enhances their self-efficacy, skill, motivation, and task goal orientation, and that these achievement outcomes also are promoted by allowing students to evaluate their performance capabilities or progress in skill acquisition. These findings are not due to goal properties, because the learning and performance goals were comparable in proximity, specificity, and difficulty. These results also cannot be due to instructional differences between treatment conditions because students in all conditions received the same amount and type of instruction and problem solving.

Emphasizing to students that their goal is to learn to solve problems can raise their self-efficacy for learning and motivate them to regulate their task performance and work diligently. Self-efficacy is substantiated as they observe their progress in skill acquisition. Higher self-efficacy helps to sustain motivation and increase skill acquisition (Schunk, 1991). Having students self-monitor their performance and evaluate their capabilities or progress in learning makes it clear that they have become more competent, and this perception strengthens self-efficacy and keeps students working productively.

The results of these studies differ in that Experiment 2 but not Experiment 1 supports the hypothesis that combining a learning goal with self-evaluation raises achievement outcomes more than does combining a performance goal with self-evaluation. The reason for this discrepancy cannot be identified precisely because the studies differed in frequency of self-evaluation (daily in Experiment 1, once in Experiment 2) and focus of self-evaluation (capabilities in Experiment 1, progress in skill acquisition and self-satisfaction with progress in Experiment 2). A daily assessment of capabilities is intensive and should clearly communicate to children that they are becoming more skillful. Under conditions of strong self-evaluation treatment, the type of goal may make little difference. In contrast, the single assessment session in Experiment 2 may not have made it clear that subjects had become more

competent. Given that this assessment was closely tied to the learning goal because it called for self-evaluation of and self-satisfaction with progress in skill learning, it complemented that goal better than the performance goal and was more likely to raise motivation and achievement outcomes. This explanation is supported by the finding in Experiment 2 that goals did not differentially affect self-efficacy for learning, so subsequent differences in achievement outcomes may have come about due to intervening self-evaluation.

These findings support theory and research on the benefits of goals and self-evaluation on self-regulation processes and achievement (Bandura, 1991, 1993; Schunk, 1989, 1990; Zimmerman, 1990, 1994; Zimmerman & Martinez-Pons, 1992). These results also are consistent with those of Elliott and Dweck (1988), who found that learning goals promoted a mastery motivational orientation regardless of type of ability feedback but that performance goals were effective only when students received high-ability feedback.

The finding that learning goals and self-evaluation raised task orientation and lowered ego orientation support the Meece et al. (1988) findings that students with task-mastery goals report active cognitive engagement characterized by self-regulatory activities and that motivation to learn is positively associated with goals stressing learning and understanding. Learning goals and self-evaluations help focus children's attention on their

task progress and capabilities for learning (Schunk, 1990; Schunk & Swartz, 1993a, 1993b). Self-comparisons of present with past performances to determine progress constitute an integral component of a task orientation (Ames, 1992). Conversely, children oriented toward performance outcomes who do not evaluate their skills may be less apt to focus on learning progress, which will not result in high task orientation. Performance goals can increase social comparisons and lead to an ego orientation as students determine their progress relative to that of peers.

The present results must be qualified because students were acquiring skills and their self-evaluations were positive. Self-evaluation may not always have desirable effects. Asking students to periodically assess their capabilities on a task they repeatedly have failed to master might lower, rather than raise, self-efficacy and motivation, because after many negative attempts students might conclude they are incapable of learning. Self-evaluation must be linked with instruction so students learn and perceive they are making progress.

The results of this project have implications for teaching mathematics. Learning goals can be easily incorporated by teachers into regular classroom instruction. Self-evaluation may be a useful adjunct to testing as a means of assessing students' skills and of providing information to use in designing instruction. Although self-evaluation and learning goals are not necessary for all

classroom activities, this research suggests that, when combined with a sound instructional program, they facilitate self-regulated learning and achievement outcomes.

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